

REMARKS

In the Final Office Action, the Examiner took the following actions:

- (a) rejected claims 11 and 20 under 35. U.S.C. 103(a) as being unpatentable over Shimagaki et al., U.S. Pat. No. 6,953,388 ("Shimagaki") in view of Burke, U.S. Pat. App. Pub. No. 2002/0098789 ("Burke") and Saka et al., U.S. Pat. No. 6,458,013 ("Saka");
- (b) rejected claims 12-16 under 35. U.S.C. 103(a) as being unpatentable over Shimagaki in view of Burke, Saka, and You et al., U.S. Patent No. 6,663,787 ("You"); and
- (c) rejected claims 17 and 18 under 35. U.S.C. 103(a) as being unpatentable over Shimagaki in view of Burke, Saka, and Jang et al., U.S. Patent No. 5,702,977 ("Jang").

Applicants propose amending independent claim 11 solely for clarity, as proposed in the telephonic interview conducted with the Examiner on May 9, 2008. Support for the amendment to claim 11 may be found in Applicants' specification at, for example, page 6, lines 13-15, and page 26, lines 8-11 and 17-25. Thus, the amendment to claim 11 does not introduce new matter. Upon entry of this Amendment after Final, claims 1-18 and 20 are pending, with claims 11-18 and 20 under current examination and claims 1-10 withdrawn from consideration.

Telephonic Examiner Interview

Applicants thank the Examiner for the time and courtesy extended in conducting a telephonic interview with Applicants' representatives on May 9, 2008. The pending Final Office Action, the Amendment filed January 31, 2008, and the proposed amendment to independent claim 11 were discussed in the interview. As noted above, Applicants propose to amend claim 11 in the manner discussed in the May 9 telephonic interview.

Rejections Under 35 U.S.C. § 103(a)

Claims 11 and 20

Applicants respectfully request withdrawal of the rejection of claims 11 and 20 under 35 U.S.C. § 103(a).

The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. Such an analysis should be made explicit and cannot be premised upon mere conclusory statements. See M.P.E.P. § 2142, 8th Ed., Rev. 6 (Sept. 2007). “A conclusion of obviousness requires that the reference(s) relied upon be enabling in that it put the public in possession of the claimed invention.” M.P.E.P. § 2145. Furthermore, “[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art” at the time the invention was made. M.P.E.P. § 2143.01(III), internal citation omitted. Moreover, “[i]n determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.” M.P.E.P. § 2141.02(I), internal citations omitted (emphasis in original).

The Examiner asserted that “compression modulus is a property of the material used and does not depend on the location of the pad.” *Id.* Moreover, in response to the Amendment filed January 31, 2008, the Examiner asserted that “[t]he applicant has amended the claims to state that the polishing pad has a modulus of elasticity of 300 to 600 MPa while on a turntable” and that “the modulus of elasticity [is] an inherent

property of the material not dependent on the location of the polishing pad.” Final Office Action at 7. The Examiner then asserted that “[s]hould the applicant argue that the modulus of elasticity being between 300 and 600 MPa while on the turntable is not inherent[,] … [t]his will result in all claims being rejected under 35 U.S.C. § 112, first paragraph, for incorporating new matter.” *Id.*

Applicants amended independent claim 11 in the January 31, 2008 Amendment to recite

[a] method of manufacturing a semiconductor device, comprising: … subjecting said treating film to a polishing treatment using a polishing pad while disposed on a turntable feeding a slurry containing abrasive grain onto said treating film, … wherein the range of the compression elastic modulus is satisfied while the polishing pad is disposed on the turntable.

As noted above, Applicants propose amending independent claim 11 to instead recite

[a] method of manufacturing a semiconductor device, comprising: … subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable while feeding a slurry containing abrasive grain onto said treating film, … wherein the range of the compression elastic modulus of the polishing pad on the turntable is satisfied.

Neither Shimagaki nor Burke, nor their combination, discloses or suggests Applicants’ claimed invention as recited in amended independent claim 11. This is at least because, as the Examiner admitted, “Shimagaki in view of Burke does not teach the compression elastic modulus of the pad.” Final Office Action at 3.

The Examiner relied on Saka to overcome the deficiencies of Shimagaki and Burke, and alleged that “Saka teaches a polishing pad having a compression elastic modulus of between 300 and 600 MPa.” Final Office Action 4. Applicants respectfully

disagree. Saka discloses use of a Rodel IC1400 commercial composite pad, consisting of two layers -- namely, "a micro porous polyurethane top layer (Rodel IC1000) and a high density urethane foam as underlayer." Saka, col. 11, lines 54-60, emphasis added. Saka discloses that the room temperature elastic modulus of the top pad (*i.e.*, the Rodel IC1000) is 500 MPa, but the room temperature elastic modulus of the composite pad is 60 MPa. *Id.* Saka discloses use of the composite pad, and not solely the top pad, in polishing experiments. Thus, the elastic modulus of the pad used by Saka for polishing experiments, *i.e.*, the composite pad, is 60 MPa, which is well outside the claimed range of 300 to 600 MPa for the compression elastic modulus, as required in amended independent claim 11. For at least this reason, Saka does not disclose or suggest the claimed "polishing pad having a compression elastic modulus ranging from 300 to 600 MPa," as recited in amended independent claim 11.

Further, Saka does not disclose or suggest "subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable," as also recited in amended independent claim 11. The polishing pad of Saka is not disposed on a turntable. Instead, Saka's polishing pad is a composite pad, containing a top layer (a Rodel IC1000 pad) disposed on a high-density urethane foam underlayer. See Saka, col. 11, lines 54-60. Thus, Saka's top layer, the Rodel IC1000 pad, which the Examiner relies on for its room temperature elastic modulus of 500 MPa, is disposed on an underlayer, and not on a turntable. *Id.*

Saka also does not disclose or suggest "the range of the compression elastic modulus of the polishing pad on the turntable is satisfied," as recited in amended independent claim 11. Saka's composite pad has a modulus of only 60 MPa and thus

fails to satisfy Applicants' claimed range. Further, Saka's top layer (Rodel IC1000), although it has a modulus of 500 MPa, is not disposed on the turntable. Thus, the mere disclosure of a top layer with a modulus of 500 MPa by Saka is not sufficient to disclose or suggest Applicants' claimed invention as recited in amended independent claim 11.

Moreover, during the telephonic interview, the Examiner appeared to suggest that since Saka discloses the use of the Rodel IC1000 as a hard pad, then it would have been obvious to one of ordinary skill in the art the time of the invention to use such a hard pad. Applicants respectfully disagree. Even if one of ordinary skill in the art at the time of the invention had considered modifying Saka to use only a hard pad, such as the Rodel IC1000, and not a composite pad as disclosed by Saka, one still would not have achieved Applicants' claimed invention. As Applicants point out in their specification, the Rodel IC1000 is a conventional hard polishing pad, containing a volume of voids or solid material higher than 5% by volume based on the entire volume of the matrix of the polishing pad. See Specification, page 4, lines 18-26. Amended independent claim 11 clearly requires that "cells and/or a recessed portion-forming material ... occupy[] a region ranging from 0.1% by volume to 5% by volume based on an entire volume of said pad" (emphasis added). Thus, the Rodel IC1000, does not meet the requirements of amended independent claim 11.

In addition, Applicants disclose in their specification that a Rodel IC1000 pad was compared to a pad according to the present invention, and that

while the number of scratches on the ... stopper film 201 was 88/wafer when then IC1000 was employed, the number of scratches was reduced to 2/wafer when the polishing pad No. 35 was employed. It was confirmed from these facts that it was possible to greatly minimize the generation of

scratch in the polishing process by using the polishing pads according to the embodiments of the present invention,

Specification, page 36, lines 3-14.

Thus, for at least these reasons, Saka, whether taken alone or modified by any knowledge of hard pads that one of ordinary skill in the art may arguably have possessed at the time of the invention, still fails to disclose or suggest each and every element of Applicants' claimed invention, as recited in amended independent claim 11. Also, at least for these reasons, Saka fails to overcome the deficiencies of Shimagaki and Burke. Therefore, Shimagaki, Burke, and Saka, whether taken separately or in any combination, fail to disclose or suggest Applicants' claimed invention, as recited in amended independent claim 11. Amended independent claim 11 should therefore be allowable over Shimagaki, Burke, and Saka, whether taken separately or in any combination. Claim 20 should also be allowable over Shimagaki, Burke, and Saka, at least due to its dependence from base claim 11. Applicants therefore respectfully request withdrawal of the rejection of claims 11 and 20.

Claims 12-16

Applicants respectfully request withdrawal of the rejection of claims 12-16. Applicants have established above that amended independent claim 11 should be allowable over Shimagaki, Burke, and Saka, whether taken separately or in any combination. Claims 12-16 should also each be allowable over Shimagaki, Burke, and Saka, at least due to their dependence from base claim 11.

The Examiner cited You for its alleged disclosure of a copper damascene method; using copper as a conductive layer to be polished; and using silicon nitride and

polyaryl ether as the second and first layers, respectively. Final Office Action at 5.

Applicants submit that You discloses “[a] method of manufacturing [a] semiconductor device” including “a first metallization level, a first diffusion barrier layer, a first etch stop layer, a dielectric layer and an opening extending through the dielectric layer, the first etch stop layer, and the first diffusion barrier layer.” You, Abstract. However, You fails to disclose or suggest Applicants’ claimed invention, at least because You does not disclose or suggest

“[a] method of manufacturing a semiconductor device, comprising: ... subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,”

as recited in amended independent claim 11. Instead, You’s disclosure is directed to “address[ing] and solv[ing] the problem of contamination during single damascene processing from copper being deposited onto a silicon oxide dielectric layer as a result of reverse physical sputtering.” You, col. 12, line 66 through col. 13, line 2. You is also directed to “address[ing] problems associated with the high capacitance of inter-metal dielectric layers.” *Id.*, col. 13, lines 18-20. You’s only references to chemical mechanical planarization (CMP) are directed merely to removing excess conductive material, with no further disclosure regarding CMP being given or suggested. See, e.g., col. 1, lines 58-61. You does not disclose or suggest the claimed polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,” as recited in amended independent claim 11.

For at least these reasons, You fails to disclose or suggest Applicants' claimed invention, as recited in amended independent claim 11. Also, for at least this reason, You fails to overcome the deficiencies of Shimagaki, Burke, and Saka. Therefore, Shimagaki, Burke, Saka, and You, whether taken separately or in any combination, fail to disclose or suggest Applicants' claimed invention, as recited in amended independent claim 11. Amended independent claim 11 should therefore be allowable over Shimagaki, Burke, Saka, and You, whether taken separately or in any combination. Claims 12-16 should also be allowable over Shimagaki, Burke, Saka, and You, at least due to their respective dependence from base claim 11. Applicants therefore respectfully request withdrawal of the rejection of claims 12-16.

Claims 17 and 18

Applicants respectfully request withdrawal of the rejection of claims 17 and 18. As established above, amended independent claim 11, and claims 17 and 18, which depend from claim 11, should all be allowable over Shimagaki, Burke, and Saka, whether taken separately or in any combination. The Examiner applied Jang in an attempt to overcome the deficiencies of Shimagaki, Burke, and Saka. Jang discloses “[a] method for forming within a trench within a substrate within an integrated circuit a planarized trench fill layer.” Jang, Abstract. Jang's disclosure regarding chemical mechanical polishing (CMP) is limited to planarizing the trench fill layer and avoiding the formation of a dish. See, e.g., Abstract. However, Jang does not disclose or suggest

“[a] method of manufacturing a semiconductor device, comprising: ... subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,”

as recited in amended independent claim 11. Jang contains no disclosure or suggestion of any properties of a polishing pad, and certainly does not disclose or suggest the claimed “polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,” as recited in amended independent claim 11.

For at least this reason, Jang fails to disclose or suggest Applicants’ claimed invention, as recited in amended independent claim 11. Also, for at least this reason, Jang fails to overcome the deficiencies of Shimagaki, Burke, and Saka. Therefore, Shimagaki, Burke, Saka, and Jang, whether taken separately or in any combination, fail to disclose or suggest Applicants’ claimed invention, as recited in amended independent claim 11. Amended independent claim 11 should therefore be allowable over Shimagaki, Burke, Saka, and Jang, whether taken separately or in any combination. Claims 17 and 18 should also be allowable over Shimagaki, Burke, Saka, and Jang, at least due to their dependence from base claim 11. Applicants therefore respectfully request withdrawal of the rejection of claims 17 and 18.

Conclusion

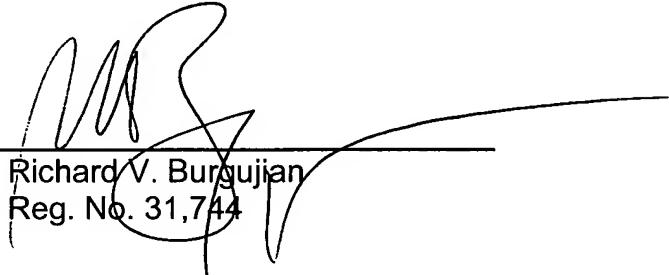
Applicants respectfully request that this Amendment after Final be entered by the Examiner, placing claims 11-18 and 20 in condition for allowance. Applicants submit that the proposed amendments do not raise new issues or necessitate the undertaking of any additional search of the art by the Examiner. Therefore, this Amendment after Final should allow for immediate action by the Examiner.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

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